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Molecular evidence for a polyphyletic genus *Japonia* (Architaenioglossa: Cyclophoridae) and with the description of a new genus and two new species

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Abstract

Cyclophoridae is the dominant family of operculated terrestrial snails in East Asia. The group consists of four subfamilies and approximately 300 species that are currently classified into 34 genera. The species occupy various habitatsand show a high morphological diversity. The molecular phylogenetic relationships of this group have not previously been discussed. In order to uncover the relationships within the family, we sequenced parts of the mitochondrial cytochrome oxidase subunit I (COI) and of the 16S rRNA gene from 32 species of 10 genera of cyclophorid and established the phylogenetic tree using neighbor joining, Bayesian and maximum likelihood analyses to construct phylogenetic trees. The results based on mtDNA sequences suggest that the genera *Cyclophorus*, *Cyclotus*, *Leptopoma*, and *Cyathopoma* are monophyletic while the traditional genus *Japonia* appeared polyphyletic and then *J. zebra* should be moved to the new genus *Pilosphaera*. In addition, *Pilosphaera yentoensis* **n. sp.** and *Japonia boonkioensis* **n. sp.** are described in this paper.

Key words: COI, 16S rRNA, *Pilosphaera, yentoensis, boonkioensis*

Introduction

Recent studies on phylogenetic relationships within the molluscan class Gastropoda have involved general morphological (e.g. Kantor 1996; Ponder & Lindberg 1997; Kay *et al*. 1998), ultrastructural (e.g. Healy 1996), and molecular (e.g. McArthur & Koop 1999; Lydeard *et al*. 2002; Remigio & Hebert 2003) approaches. These investigations have provided new insights into gastropod affinities and classification and have enabled a vigorous testing of taxonomic schemes for the group. While phylogenetic relations among major gastropod taxa has received much recent attention (Tillier *et al*. 1992; Ponder & Lindberg 1997; Rosenberg *et al*. 1997; Thollesson 1999; Remigio & Hebert 2003), relationships within many small clades are still poorly understood. An example is the morphologically diverse family Cyclophoridae which consists of approximately 300 species that are currently arranged into 34 genera, living in tropical and subtropical areas. The most generally accepted system of classification today partitions the diverse Cyclophoridae into four subfamilies (Vaught 1989; Millard 1996) of which the subfamily Cyclophorinae is morphologically extremely diverse. In contrast, the other three subfamilies, viz. Spirotomatinae, Alycaeinae, and Pterocyclinae are morphologivally less diverse. Although some investigators treat Spirotomatinae and Alycaeinae as independent families (Higo & Goto 1993; Azuma 1982), their subordinate taxa are uncontentious. However, the traditional classification is based on shell morphology, but part of the shell morphology may be subject to convergent evolution and thus may hamper a straightforward taxonomy (Lee *et al*. 2008). Thus, the knowledge of Cyclophoridae is limited and resolving their phylogenetic issues deserves interest.

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